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PATENT
Docket No.: 8733.014.00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#25 Decl. Martha 11/27/01

In re Application of:	Yong Sung HAM	Group Art Unit:	2871
Application No.:	09/134,405	Examiner:	T. DUONG
Filing Date:	August 14, 1998		

For: IN-PLANE SWITCHING MODE LIQUID CRYSTAL DISPLAY DEVICE

RECEIVED NOV 26 2001 TC 2800 MAIL ROOM

DECLARATION UNDER 37 C.F.R. §1.132

ASSISTANT COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20231

Sir:

I, Yong Sung HAM, declare as follows:

1. I obtained a Bachelor's degree in Physics from the College of Science at Korea University in 1989 and a Master's degree in Statistical Physics from the Graduate School of Physics at Korea University in 1991. In 1994, I began employment with Goldstar Co., which became LG.LCD, and officially became LG.Philips LCD Co., Ltd. (LG. Philips) in 1999. From 1994 to present, I have developed and researched various technologies for LG.Philips (and its predecessor companies) including the following:

2001 Developed "ODC" (High-Speed Driving)
2000 Developed "A-IPS" (Advanced-IPS)
1999 Researched "Display Using MEMS"
1997 Researched and studied "IPS Mode"
1996 Researched and studied "MD TN Mode" (TD-TN, C-TN, DD-TN)
1994 Designed "TN Mode"

2. I am the sole inventor of the above-identified application and I am fully familiar with the prosecution of this application including the Office Action dated May 22, 2001. I have carefully reviewed the claims, specification and prior art in this application. I have also reviewed the Examiner's rejection of claims 1-3, 5, 8, 9, 12-14, 16, 19, 20 and 23-27 in the subject application under 35 U.S.C. §103(a) as being unpatentable over Applicant's prior art Figures 1A-1B in view of Ohe et al. (U.S. Pat. No. 5,910,271) and claims 4, 6, 7, 10, 11, 15, 17, 18, 21 and 22 in the subject application under 35 U.S.C. §103(a) as being unpatentable over Applicant's prior art Figures 1A-1B and Ohe et al. as applied to claims 1-3, 5, 8, 9, 12-14, 16, 19, 20 and 23-27 above, and further in view of Yanagawa et al. (U.S. Pat. No. 5,870,160) and Kang et al. (U.S. Pat. No. 5,464,669).

3. The purpose of this declaration is to set forth the unexpected results that I achieved in an in-plane switching mode liquid crystal display device when the thickness of the liquid crystal layer is determined by considering the color-shift as well as the light transmittance.

Preferably, $d\Delta n$ is in the range of 0.29-0.36 μm. Based on the herein disclosed evidence, the subject matter of the present invention is not obvious in view of Applicant's Prior Art Figures and the Ohe et al., Kang et al., and Yanagawa et al. references.

4. Briefly, claim 1 recites an in-plane switching mode liquid crystal display device comprising first and second substrates; a plurality of gate and data bus lines defining pixel regions and the range on the first substrate; a common line in the pixel region; a common line in the data bus lines having a crossing relationship; a pair of first and second electrodes parallel to each other applying plane electric fields in the pixel regions; and a liquid crystal layer between the first and second substrates, wherein $d\Delta n$ is in the range of 0.29-0.36 μm, where d is the thickness of the liquid crystal layer and Δn is the refractive anisotropy of the liquid crystal molecule. Claim 12 recites a method of making the device of claim 1. Claim 23 recites a combination of features including a data electrode and a common electrode that are parallel to each other applying plane electric fields in the pixel regions. Claim 24 recites a method of making the device of claim 23.

5. I have conducted numerous experiments designed to determine the occurrence of color-shift. Controlling the refractive anisotropy of the liquid crystal molecule and the thickness of the liquid crystal layer increases the light transmittance.

6. In my experiments, the thickness of the liquid crystal was chosen by taking into account the light transmittance and the color-shift. Each alignment direction of the first and second alignment layers is determined by a rubbing method or by photo-alignment method using a photo-sensitive material. Color-shift, which is generated in an in-plane switching mode LCD, is influenced by backlight, color filter, and $d\Delta n$ of the liquid crystal layer. In particular, conventional backlight and color filter may be used, but $d\Delta n$ is chosen to prevent color-shift. Moreover, the $d\Delta n$ is chosen to maintain white-color balance. Figure 2 of the present application is a graph showing a variation of light transmittance according to a variation of retardation and Figure 3 is a chromaticity diagram showing a white color-shift in a triangle.

7. Accordingly, the above-discussed experiments disclosed in the specification and illustrated in Figures 2 and 3 of the present application show the unexpected results obtained by using the thickness of the liquid crystal layer to increase the light transmittance by controlling the refractive anisotropy and to prevent color-shift. These unexpected results would not have been expected from the teachings of the prior art. Therefore, based on this evidence, I believe that claims 1-28 recite non-obvious subject matter over the prior art since there is no teaching that would suggest the unexpected benefits of the claimed structure.

8. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that the statements were made with the knowledge that willful false statements and the like so-made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Nov. 20 2001
Date

Yong Sung HAM
Yong Sung HAM